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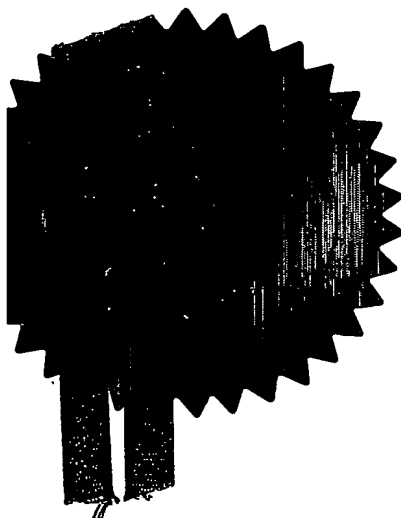
I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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Signed

*Stephen Hordley*

Dated

24 April 2003

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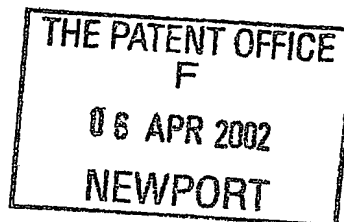
By virtue of a direction given under Section 30 of the Patents Act 1977, the application is proceeding in the name of

INOVAIR LIMITED  
Incorporated in the United Kingdom  
58 Michelham Gardens  
Strawberry Hill  
London  
TW1 4SB  
United Kingdom

[ADP No. 08387193001]

# Request for grant of a patent

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The Patent Office

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1. Your reference

SPG/P36753

0208028.1

2. Patent application number

(The Patent Office will fill in this part)

06 APR 2002

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Huib Maat  
66 Michelham Gardens  
Strawberry Hill  
London  
TW1 4SB  
United Kingdom

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

SECTION 30 (1977 ACT) APPLICATION  
8335366001  
07-05-02

4. Title of the invention

Microporous Membrane Air Freshening Device

5. Name of your agent (if you have one)

Harrison Goddard Foote

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

31 St Saviourgate  
YORK  
YO1 8NQ

Patents ADP number (if you know it)

14571001-

7914237002

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description

6

Claim(s)

4

Abstract

Drawing(s)

8

8 x 8 SW

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

S.P. Gilholm

Date

5 April 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

S P Gilholm

01904 732120

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## MICROPOROUS MEMBRANE AIR FRESHENING DEVICE

This invention relates to an air freshening device incorporating a microporous membrane.

5

Conventional liquid air fresheners generally comprise a reservoir containing a fragrance solution, into which dips a wick, which is connected to an emanating surface. The perfume solution travels up the wick to the emanating surface from which the perfume evaporates and freshens the surrounding atmosphere. In many examples the wick and emanating surface are formed from the same item. The fragrance solution may be a true solution (comprising a perfume base and a solvent that is miscible with the perfume base) or a colloidal solution (comprising perfume base, water, a surfactant which solubilises the perfume in the water, and optionally solvents).

10

15

One disadvantage of conventional liquid air fresheners is that the fragrance solution can leak from the packaging should the device be accidentally knocked over. This imposes certain limitations with regards how the product is used, and the types of design forms that the product can take.

20

More recently air freshening devices incorporating hydrophobic polymeric membranes have been developed. US Patent No. 4,145,001, to American Can Co. describes a volatile deodoriser sandwiched between the layers of a laminate material.

25

International Patent Application No. WO 98/23304, to Burgopack Stampa describes a container for volatile substances comprising a plurality (five) of outer impermeable plies, detachable from a permeable ply.

30

US Patent No. 5,804,264 to American National Can Co. describes a multilayer permeable membrane for use in air fresheners comprising low density polyethylenes.

Such devices comprise a fragrance composition contained within a sealed reservoir. At least one wall of the reservoir comprises a membrane, for example, which is constructed from a material that is permeable to perfume vapours. However, such devices suffer from the disadvantage that the water is unable to migrate through the  
5 membrane and thus the liquid, or gel, compositions used in such devices are essentially anhydrous. The compositions generally comprise a perfume base and, optionally, a volatile solvent and, optionally, a small amount of a thickening agent, such as, a fumed silica or ethyl cellulose. The compositions, being essentially free of water, tend to be relatively expensive.

10 Thus there has long been a need for a device which comprises a water based system but which does not suffer from the disadvantages of, *inter alia*, leaking, as hereinbefore described.

15 Teslin® (origin: PPG Industries) is described in US Patent No. 4,861,644 and comprises a single layer, highly filled, microporous film and is conventionally used as a synthetic printing sheet. Teslin® is essentially a matrix of linear ultrahigh molecular weight polyolefin a very large proportion of finely divided particulate siliceous filler, and a high void content microporous material.

20 More specifically, although different grades of Teslin® are available, Teslin® generally comprises a polyolefin which contains approximately 60% w/w non-abrasive filler. The structure is approximately 65% v/v air. Teslin® can be fusion bonded by impulse sealing to various thermoplastics and certain thermosets.

25 Teslin® is generally known to be useful as a material for, e.g. label printing.

We have now surprisingly discovered that certain known microporous materials, such as Teslin®, can be used to construct a membrane for use in, for example, an  
30 aqueous based liquid air freshening device. Such materials are especially advantageous in that they are capable of simultaneously acting as both a microporous

membrane and a wick. Moreover, materials, such as Teslin® possess the ability to wick along the plane of the membrane.

Thus, according to a first aspect of the invention we provide a liquid air freshener which comprises a perfumed air freshener base housed in a reservoir, at least one wall of which comprises a wicking membrane.

Preferentially, the perfumed air freshener base is an aqueous system.

By the term wicking membrane we especially mean a membrane which is capable of performing a wicking action in the plane of the membrane.

Thus according to a preferred feature of the invention we provide a liquid air freshener which comprise an aqueous perfumed air freshener base housed in a reservoir, at least one wall of which comprises a microporous membrane which membrane comprises a matrix of linear-ultrahigh molecular weight polyolefin, a very large proportion of finely divided particulate siliceous filler, and a high void content.

In a preferred embodiment of the invention the microporous membrane may comprise Teslin®.

The thickness of the membrane may vary and may be for example, from 0.05 to 2.0 mm thick, preferably from 0.7 to 1.8 mm, more preferably from 0.8 to 1.4 mm, e.g. 1.0 mm thick.

25

The remaining walls of the reservoir may comprise any conventionally known material, for example, a plastics material. Any conventionally known plastic material may be used, such as, for example, of polyethylenes, polypropylene, polymethyl methacrylate, ABS, polystyrene, rigid PVC, and polycarbonate. A preferred material is a polyolefin, e.g. polypropylene.

30

Alternatively, the plastics material may comprise a laminate material. Such a laminate may comprise any of the aforementioned materials. In a further embodiment the laminate may comprise one or more of the aforementioned materials bonded to a more robust material such as glass or ceramic, e.g. porcelain, wood,  
5 stone, etc.

Preferentially, the reservoir surface, or at least an edge of the surface, may comprise a weldable material, thus facilitating welding to the membrane. Examples of such weldable materials include, but shall not be limited to, polyethylene laminates, such  
10 as PET/PTE laminates and Barex PE laminates.

The Teslin® may be fusion bonded to, for example, a flat panel samples of polyethylenes, polypropylene, polymethyl methacrylate, ABS, polystyrene, rigid PVC, polycarbonate, Barex, PET and Plexiglas.

15 The perfume solution may be a conventional aqueous composition comprising water, at least one surfactant, a perfume base and optionally one or more solvents.

The perfume solution may generally comprise between 0.01% to 100% w/w by weight of perfume, 5 and 30% by weight of perfume. Usually the concentration of  
20 perfume is between 8 and 20% by weight, often about 10% by weight.

Alternatively it may be an aqueous, surfactant free composition such as those described in US 4,663,081 or US 6,180,595 incorporated herein by reference.

25 Alternatively, it may be a composition consisting of 100% fragrance or fragrance and solvent only.

The microporous structure of the Teslin® absorbs the perfume solution, which can  
30 then evaporate to the surrounding atmosphere. Further, the microporous properties of Teslin® facilitate wicking inside the membrane ensuring that the evaporative



surface area remains saturated with perfume solution throughout the life of the product thus guaranteeing consistent fragrance intensity over the lifetime of the product. Furthermore, even when used in an inverted orientation with the Teslin® downwards, the perfume solution does not drip or leak from the device.

5

In a yet further embodiment of the invention the reservoir may be provided with a wicking means. The wicking means may comprise a conventional wicking member, e.g. a central wick which abuts the membrane surface. Alternatively, the wicking means may comprise one or more capillary grooves in the wall of the reservoir. In a yet further alternative, the wicking means may comprise an inner sleeve in the reservoir, for example, the inner sleeve may rest on the floor of the reservoir and abut the inner surface of the membrane.

10 The invention will now be described by way of example only and with reference to the accompanying drawings.

Figure 1 shows a diagram of a liquid air freshening device that comprises a moulded polypropylene reservoir, to which is fusion bonded a Teslin® microporous film;

20 Figure 2 is a schematic representation of an inverted reservoir;

Figure 3 is a schematic representation of a reservoir provided with a central wick;

Figures 4a to 4d are schematic representations showing capillaried walls; and

25

Figure 5 is a schematic representation of a reservoir provided with an inner film.

Referring to Figure 1, a plastics, e.g. polypropylene, reservoir comprises one wall, e.g. the front wall, which is a Teslin® membrane. The membrane is fusion bonded to the walls of the reservoir. Preferentially, the base of the reservoir is provided with a lip at the end of the front face, enabling the reservoir to stand vertically by resting on

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the lip and the rear of the base. In use, the reservoir may be filled, or partially filled, with a liquid air freshener.

Referring to Figure 2, a reservoir may be inverted and the Teslin® film does not leak  
5 the perfume solution.

Referring to Figure 3, a reservoir may have the membrane at the top and to ensure  
continuous feeding of the membrane the performance of the air freshener may be  
improved by incorporating a central wicking member into the reservoir.

10

Referring to Figures 4a to 4d, as an alternative to the central wicking member, the  
inner surface of the reservoir walls may be provided with a plurality of capillaries  
which facilitate the transfer of the perfume solution to the membrane surface.

15 Referring to Figure 5, the reservoir may be provided with an inner sleeve. The inner  
sleeve sits on the base of the reservoir and the distal end of the sleeve abuts the inner  
membrane surface. Thus, the capillary action of the sleeve transports the perfume  
solution to the inner membrane surface. Alternatively, the sleeve may be a sheet that  
is inserted into the outer container and forced into the shape by the outer container,  
20 thus lining the inside wall of the outer container. In this way the two ends of the sheet  
may overlap.

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## CLAIMS

1. A liquid air freshener which comprises a perfumed air freshener base housed in a reservoir, at least one wall of which comprises a wicking membrane.
- 5 2. A liquid air freshener according to claim 1, characterised in that the perfumed air freshener is an aqueous perfumed air freshener.
3. A liquid air freshener according to claim 1 characterised in that the  
10 membrane comprises a matrix of linear ultrahigh molecular weight polyolefin, a very large proportion of finely divided particulate siliceous filler, and a high void content.
4. A liquid air freshener according to claim 3 characterised in that the microporous membrane comprises Teslin®.
- 15 5. A liquid air freshener according to claim 1 characterised in that the thickness of the membrane is from 0.05 to 2.0 mm.
6. A liquid air freshener according to claim 5 characterised in that the thickness  
20 of the membrane is from 0.7 to 1.8 mm.
7. A liquid air freshener according to claim 6 characterised in that the thickness of the membrane is from 0.8 to 1.4 mm.
- 25 8. A liquid air freshener according to claim 1 characterised in that the remaining walls of the reservoir comprise a plastics material.
9. A liquid air freshener according to claim 8 characterised in that the plastics material is selected from one or more of polyethylene, polypropylene, polymethyl  
30 methacrylate, ABS, polystyrene, rigid PVC, polycarbonate, Borex, PET and Plexiglas

10. A liquid air freshener according to claim 1 characterised in that the reservoir comprises a laminate material.

5 11. A liquid air freshener according to claim 10 characterised in that the laminate comprises a plastics material bonded to a glass, ceramic, wood, stone, porcelain, etc.

12. A liquid air freshener according to claim 10 characterised in that the reservoir surface, or at least an edge of the surface, comprises a weldable or fusable material.

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10 13. A liquid air freshener according to claim 7 characterised in that the weldable or fusable material is a polyethylene laminates.

14. A liquid air freshener according to claim 13 characterised in that the laminate is selected from PET/PE laminate and Barex/ PE laminate.

15

15. A liquid air freshener according to claim 9 characterised in that the plastics material is polypropylene.

20 16. A liquid air freshener according to claim 1 characterised in that the membrane is fusion bonded to the reservoir.

17. A liquid air freshener according to claim 1 characterised in that the reservoir is provided with a wicking means.

25 18. A liquid air freshener according to claim 17 characterised in that the wicking means comprises a central wick which abuts the membrane surface.

19. A liquid air freshener according to claim 17 characterised in that the wicking means comprises one or more capillaries in the wall of the reservoir.

20. A liquid air freshener according to claim 19 characterised in that the wicking means comprises one or more capillary grooves or tubes in the wall of the reservoir.
21. A liquid air freshener according to claim 17 characterised in that the wicking means comprises a continuous, overlapping or interrupted inner sleeve in the reservoir.
22. A liquid air freshener according to claim 21 characterised in that the inner sleeve contains one or more capillaries.
23. A liquid air freshener according to claim 19 characterised in that the inner sleeve contains one or more capillaries, grooves or tubes.
24. A liquid air freshener according to claim 1 characterised in that the concentration of perfume is in the range of from 0.01% to 100% w/w.
25. A liquid air freshener according to claim 1 characterised in that the perfume solution comprises water, at least one surfactant, a perfume base and, optionally, one or more solvents.
26. A liquid air freshener according to claim 25 characterised in that the perfume solution comprises between 5 and 30% by weight of perfume.
27. A liquid air freshener according to claim 26 characterised in that the perfume solution comprises between 8 and 20% by weight of perfume.
28. A liquid air freshener according to claim 27 characterised in that the perfume solution comprises about 10% by weight of perfume.
29. A liquid air freshener according to claim 1 characterised in that the perfume solution is an aqueous, surfactant free composition.

30. A liquid air freshener according to claim 24 characterised in that the perfume solution is selected from those described in US 4,633,081 or US 6,180,595.

5 31. A method of manufacturing a liquid air freshener device according to claim 1 which comprises fusion bonding a membrane to a plastics reservoir which reservoir is adapted to house a liquid air freshener.

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10 32. A method according to claim 31 characterised in that the microporous membrane comprises Teslin®.

15 33. The use of a microporous membrane comprising a matrix of linear ultrahigh molecular weight polyolefin, a very large proportion of finely divided particulate siliceous filler, and a high void content in the manufacture of a liquid air freshener device according to claim 1.

34. The use according to claim 33 characterised in that the membrane comprises Teslin®.

20 35. A liquid air freshener substantially as described with reference to the accompanying drawings and examples.

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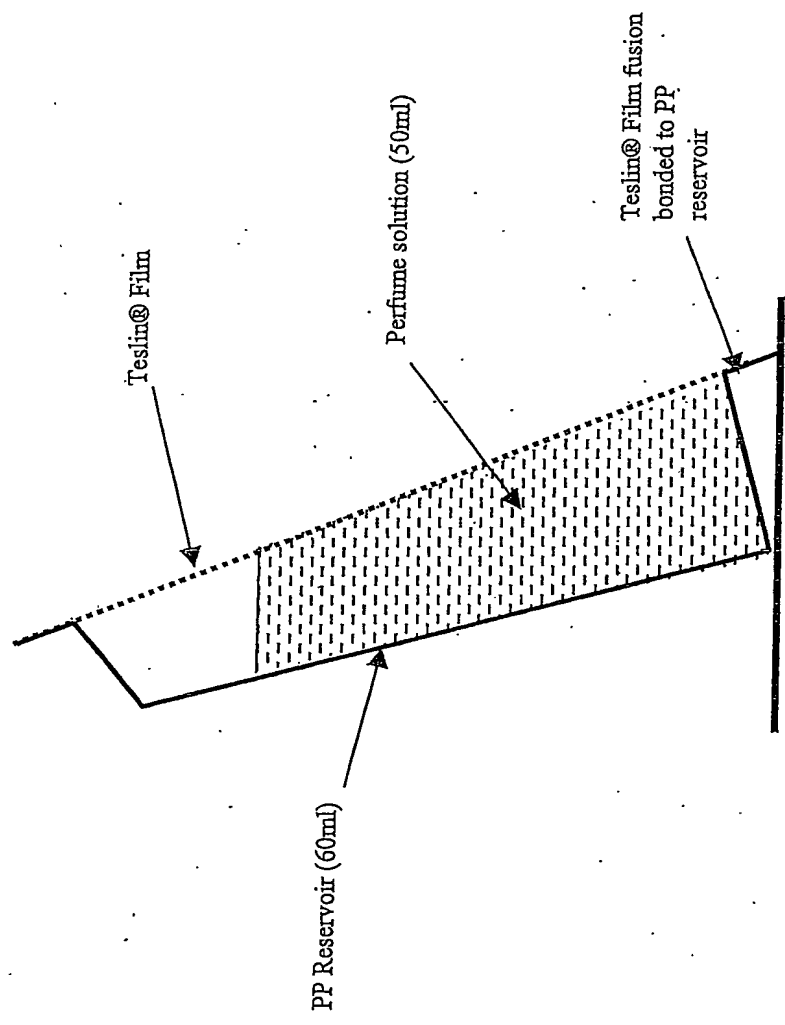


Figure 1

Figure 2

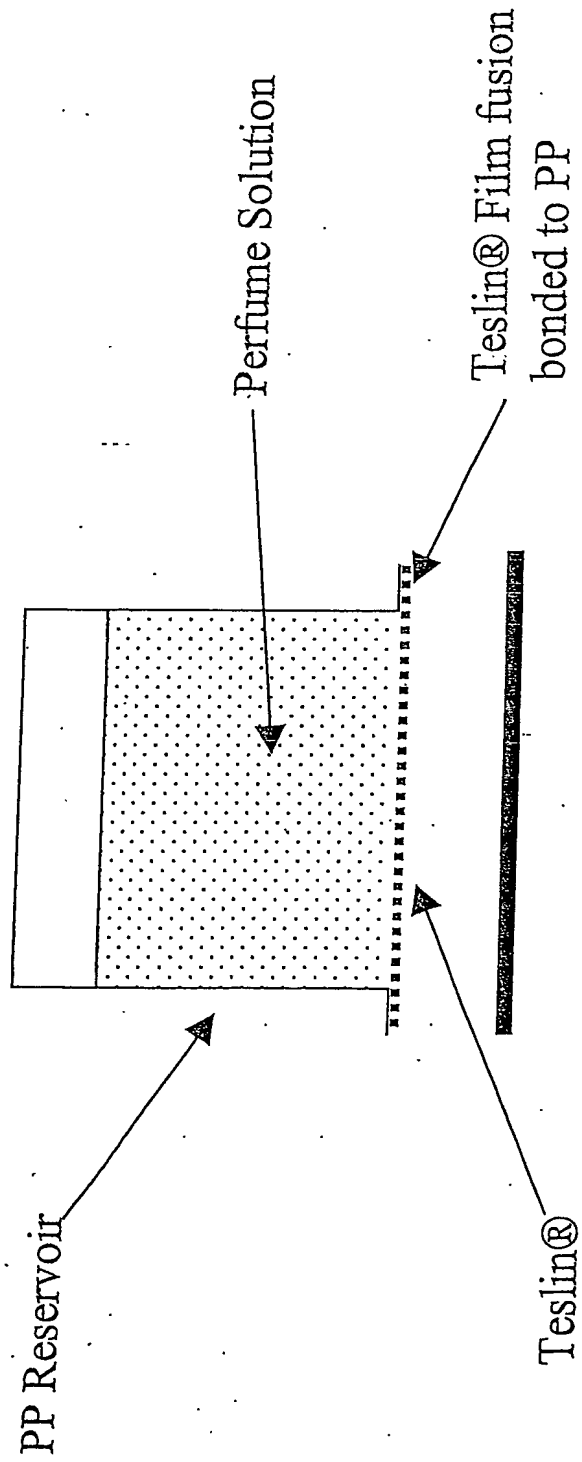




Figure 3

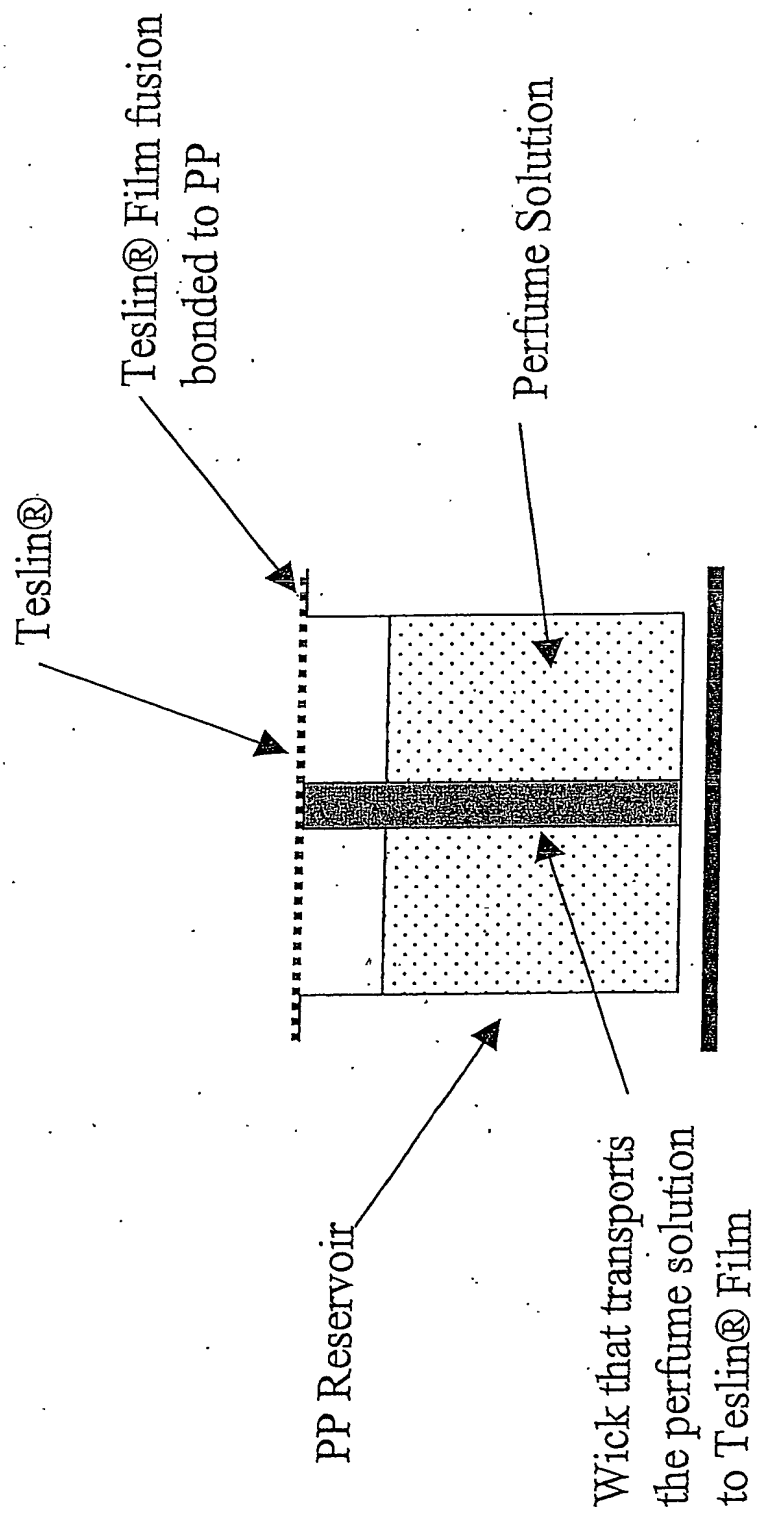


Figure 4 A

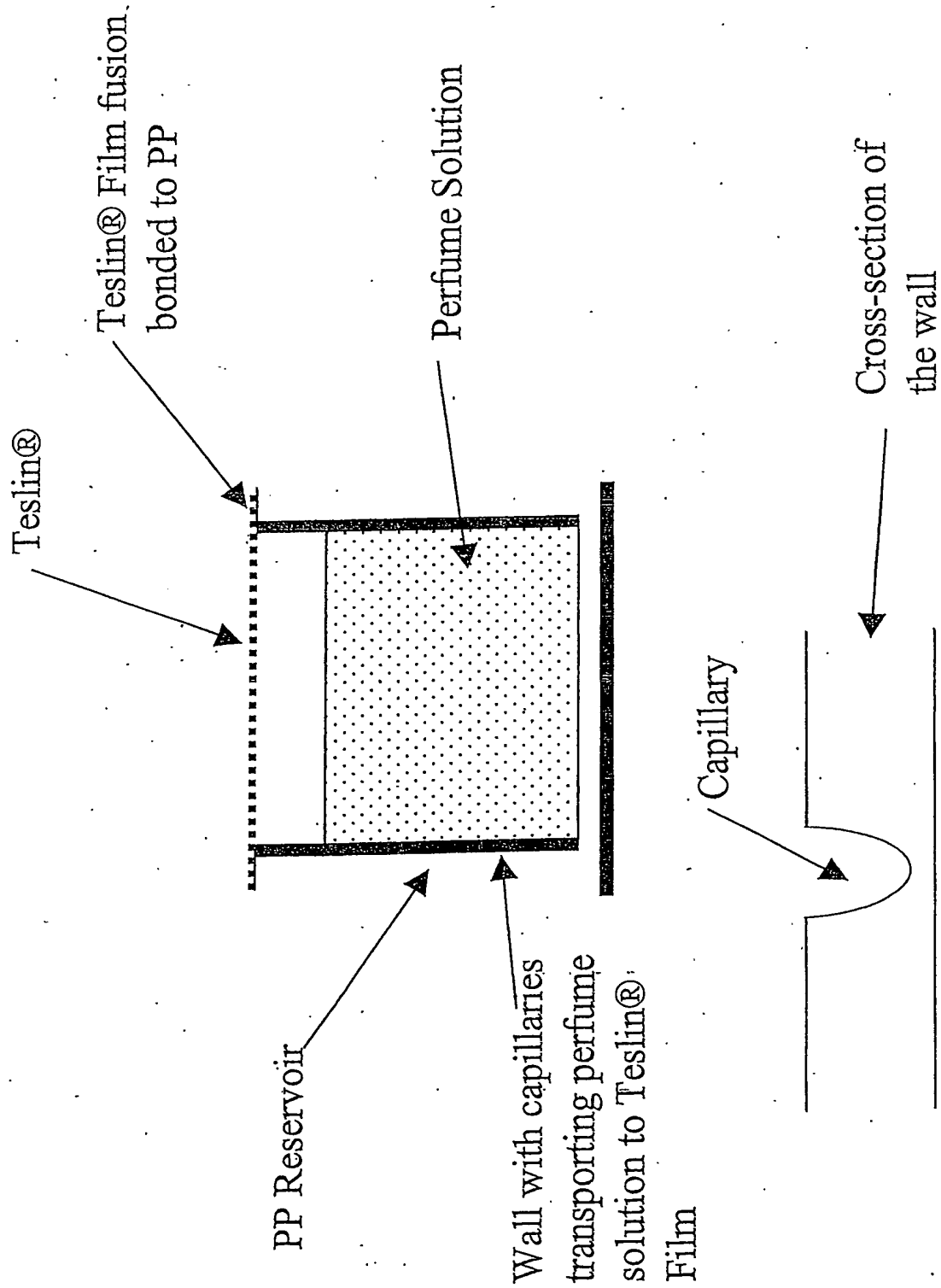


Figure 4 B

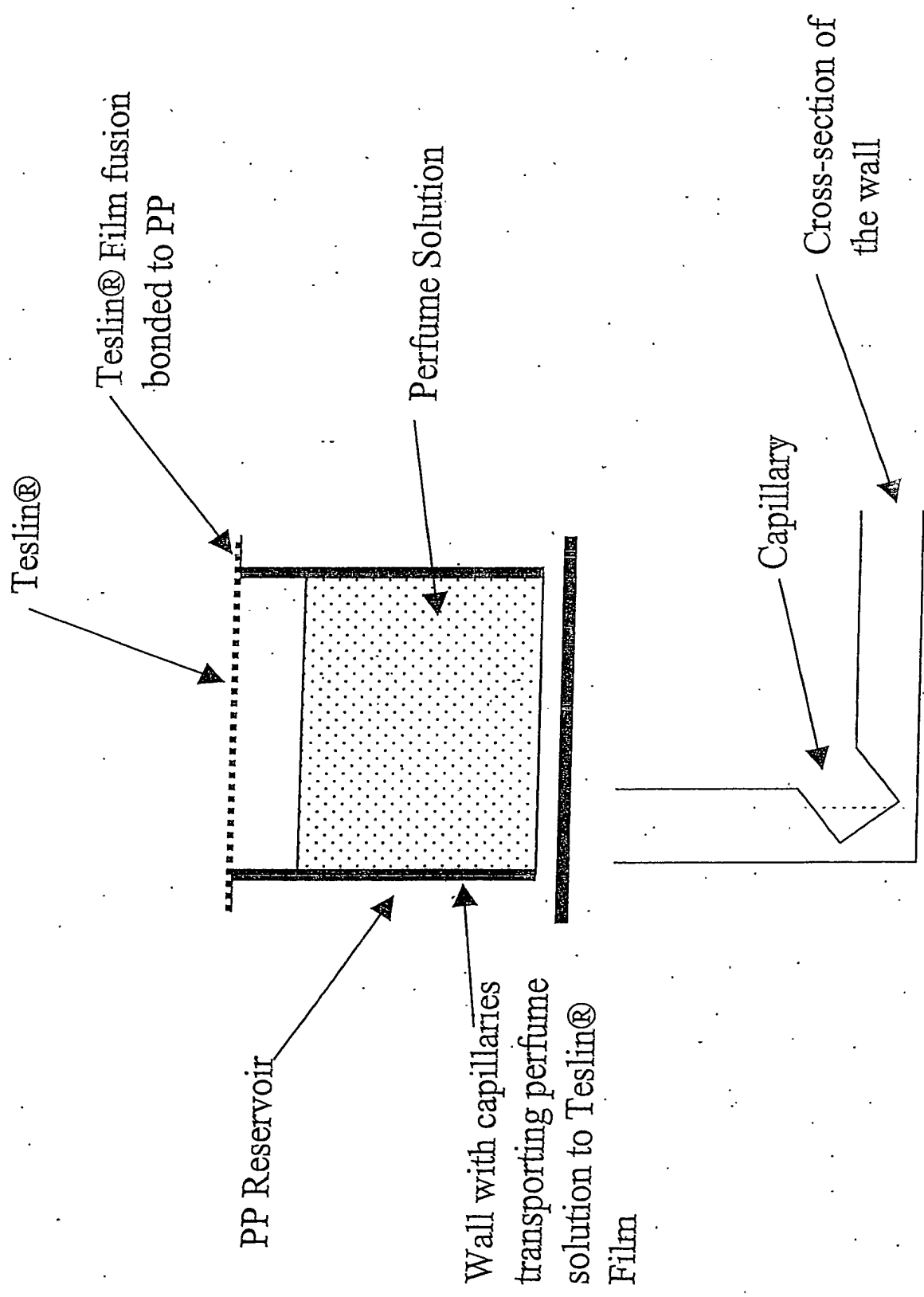


Figure 4 C

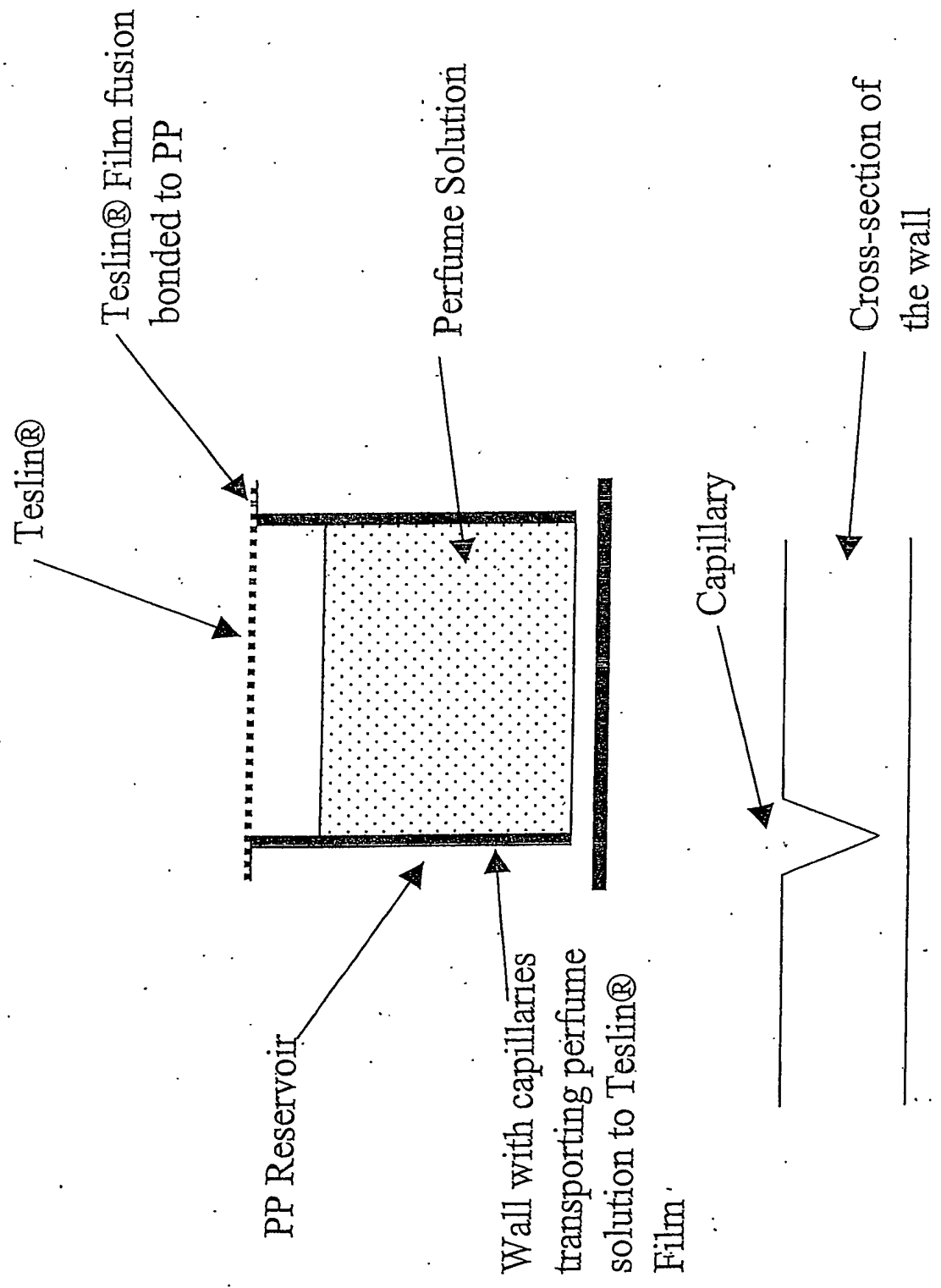


Figure 4 D

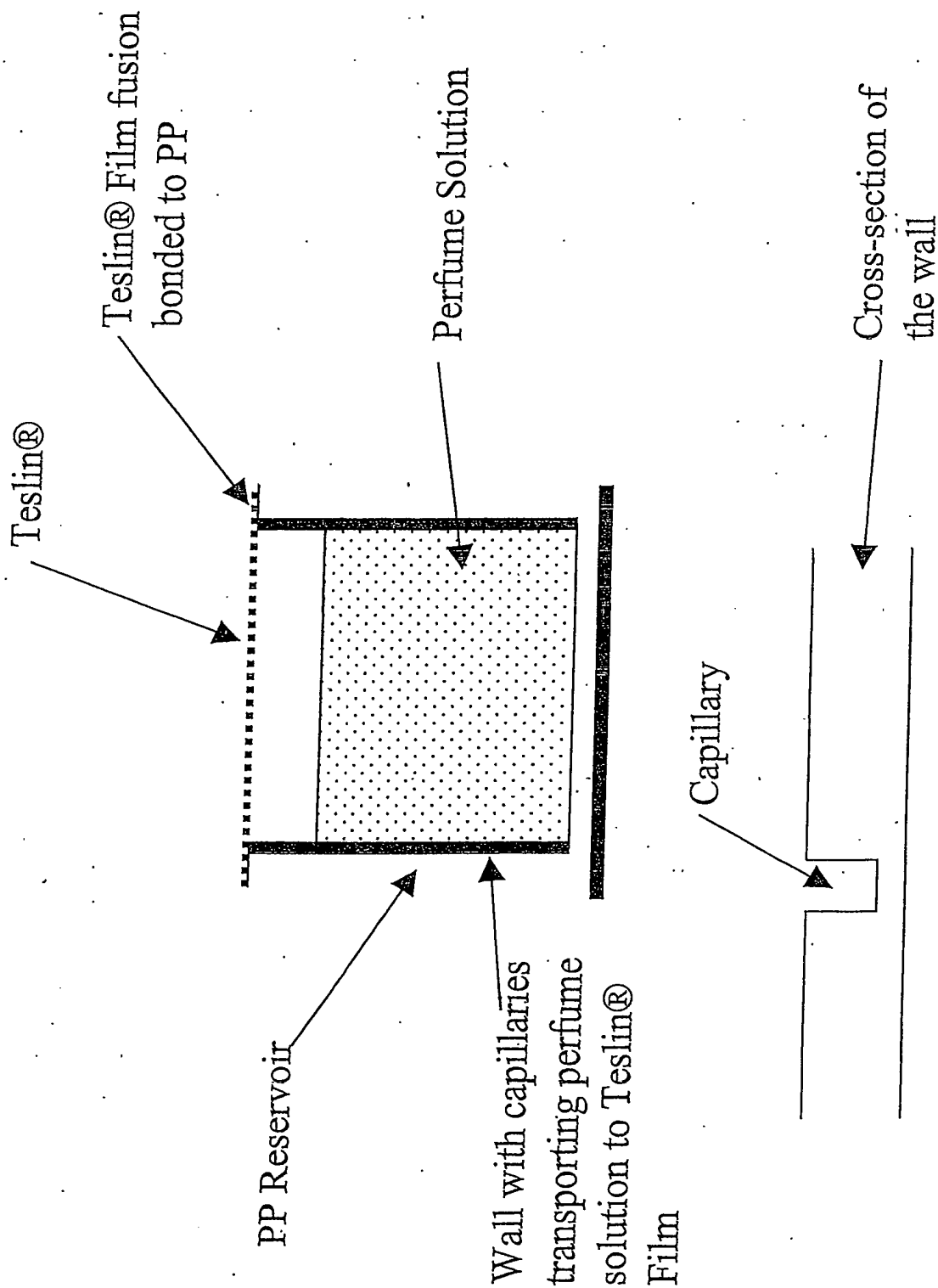
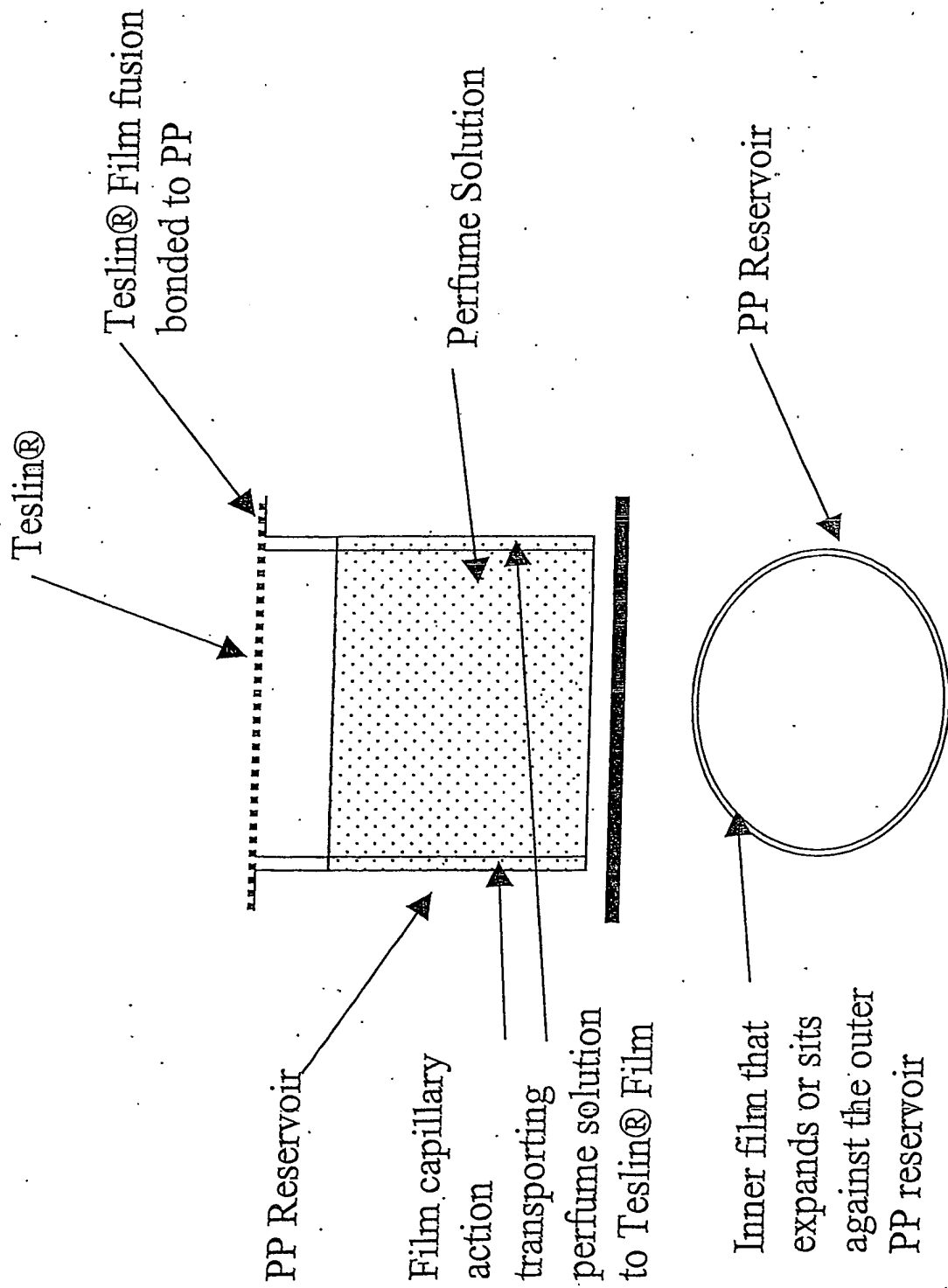


Figure 5



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